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Performance improvement of mobile cloud by implementing a scheduler software layer

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ABSTRACT: The mobile cloud computing (MCC) has permit a huge facility to get information from internet, a simple user now can connect anywhere and any when for receive the desirable information. But despite that, the mobile cloud are not yet capable to resolve same problems, like the mobile energy consumption. The batteries lifetime of mobile devices presents a major concern for customers, because of the variety applications available in the cloud, customers are often connected to the internet what their cause a massive energy consumption. This consumption is made also by the presence of heavy applications hosted in the cloud that require interesting resources.
This paper proposes an implementation of a software layer that allows an intelligent scheduling of equipment in the mobile Cloud and permits also a fast processing of customer requests that will lead to a considerable conservation of energy and therefore a powerful and ecological system.

KEYWORDS: Cloud MCC, energy, scheduling, network.

1 INTRODUCTION

Today IT development was redirected towards the mobile environment since it generates a lot of money in favor of large customers in the different continents; the applications developed have affected all aspects of professional and personal entertainment of the customer. [1].

Currently the majority of the world population has become much attached to the telecommunications technologies, connect to the internet every day has become an indispensable operation for anyone that have a mobile terminal. This addiction to the new technologies is due to the ease of obtaining information, all you need a mobile and wireless system(4G network for example) for having the likeable information.

The switching to mobile computing was with the presence of wireless networks, such as Wi-Fi, 3G and 4G. Despite this telecommunications system has enabled a mobility and flexibility to have information in the desired time and location, they are still unable to cope with some problems such as ensuring a good quality of service when the signal decreases, saving energy consumption of batteries and obviously reduce the overload of the equipment. [2]-[3]

This paper propose an implementation of a system that splits a customer request between the others devices (best elected devices) for minimizing the processing time, the results have shown that the implementation of this system contributes significantly to a considerable minimization of the request processing time and therefore minimizing the energy consumed.

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The paper is organized as follows: Section (1) presents the mobile Cloud computing, Section (2) describes the functioning of the system proposed.

2 MOBILE CLOUD COMPUTING

The explosion in number of users is surely due to the large distribution of mobile devices in the word, a study conducted by Gartner (June 2015) showed that the number of Worldwide Device is reach 256 Million Units.

Table 1. Worldwide Device Shipments

Worldwide Device Shipments by (Segment Thousands of Units)	2013	2014	2015
Traditional PCs (Desk-Based and Notebook)	296,131	276,221	261,657
Ultra mobiles, Premium	21,517	32,251	55,032
Tablets	206,807	256,308	320,964
Mobile Phones	1,806,964	1,862,766	1,946,456

As show the Table 1, a significant number of internet user has emerged from the static to the mobile IT, this is due to the capability of the newest mobile equipment can perform many interesting tasks (sending mail, using heavy applications, storing big data).

The cloud has made a tremendous maturity for the mobile environment because it allowed him to use powerful resources beyond their performance, such as storage, hardware (RAM, CPU) and network. The cloud mobile users can use multiple services on demand according to their needs: [5]

Fig. 1. Types of cloud computing

- Infrastructure as a service (IAAS): This is the lowest level of the cloud computing delivering services; the cloud user can deploy remotely material resources as virtual servers (virtual machines).
- Platform as service (PAAS): The cloud providers prepares a test environment including the necessary prerequisites for testing the application's client. This type of cloud computing is often designed to the developers.
- Software as a service (SAAS): A software-delivering model that permit to the client to benefit of the software functionalities without installation, in general the client use the web browser for use the software.
- Data as service: (DAAS): The customer can benefit from storage resources; it can store its data in remote servers.
- Backend as service (BAAS): A delivering model that help developers make setup, management and linking their applications to the backend cloud storage.
- Compute as service (CAAS): A delivering model that permit to benefit from many features as a services such as computer, network, software, emailing, storage.

3 PROPOSED WORK

3.1 DESCRIPTION

To resolve the consumption energy problem in the mobile cloud computing environment, a layer architecture are proposed that ensure a best scheduling equipment, this layer permit a dividing of the customer request between the best elected mobiles in the network based on the following criteria such as : resources consumption, distance between mobiles, network signal, availability.

This layer is a set of component that provide these functionalities:

- Locator agent (LA): returns the localization of the mobile equipment.
- Splitter agent (SA): it divides the client request between the best-elected mobile returned by the monitor agent.
- Monitor Agent (MA): this agent monitors the resources allocations, availability and signal power of the mobile equipment.
- Mobile agent (MoA): Is an agent installed in each mobile for ensuring the communication between mobiles.

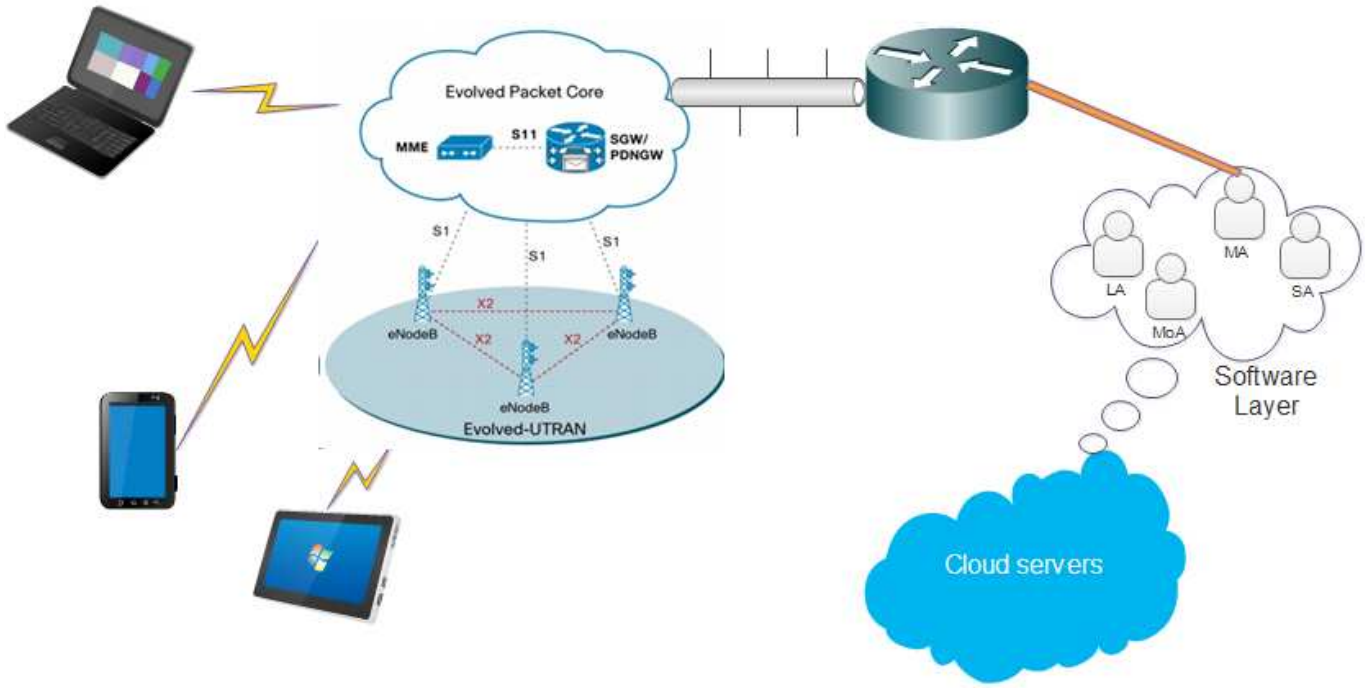

Fig. 2. The proposed system

As shown the Fig 2, the proposed layer is an intermediary between the client and the cloud servers, it receives the request from the client, contact the cloud servers and come back the response to the client after doing the necessary process in a very short time with the minimum of energy consumption.

When the client wants run an application in a cloud service, the locator agent starts by detecting the nearby equipment. Then the agent monitor keeps the less overloaded in terms of resources consumption (RAM, CPU, Disk, signal strength, battery percentage), the next step is performed by the splitter agent, it divide the client's process by the mobile selected by the monitor agent, and finally when each mobile ends hit task, it sends the result to the concerned client.

4 RESULTS

We installed a test model to test our work, for this we have implemented a cloud infrastructure of three powerful servers in each one (64 GB, 24 CPU) and a storage capacity of 30TB for delivering cloud services to the client. In our experimentation, we had use windows tablet for simulating the mobile behavior in the mobile cloud. For testing also the heavy applications

hosted in the cloud, a program in language C was developed that need an important resource to execute was injected in some machines.

As already mentioned, this software layer allows a splitting of user's Request for a fast processing and less consuming energy, the table shows the result when the implementation of this layer is made:

Table 2. Processing Time and Power Usage consumption

Devices number	Processing time (second)	Average power usage (Watt)
1	5754	23
2	2886	19
3	1732	16
4	1442	13

As shows the table 2, when the implementation of the proposed layer is made, a significant decline in processing time of customer processes is ensured by its distribution over the different mobile elected by the Monitor agent, also the power usage is decrease because the equipment mobile come more offload by processing just a part of the hole process.

To ensure that the energy consumed by a mobile for processing the request's customer in the case without using the proposed layer exceed the energy summation by all selected devices by monitor agent, we had calculate the energy by the formula as below and we found the following result as shown the Fig 3:

$$Energy = proc\_time * \sum_{i=1}^{n} power\_usage_i \qquad (1)$$

Which $proc\_time$ is the processing time for a customer process, $\sum_{i=1}^{n} power\_usage_i$ is the sum of the power usage consumed by the different mobile and n is the number of mobile device elected by the Monitor agent.

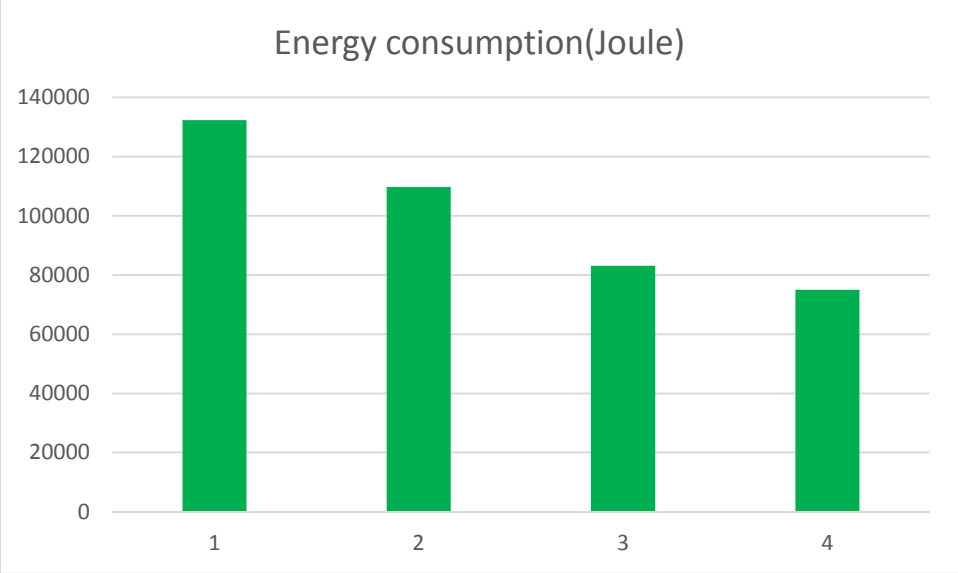

Fig. 3. Thee energy consumption by number of mobile

5 CONCLUSION

The mobile cloud computing (MCC) has become more and more present in our life and that is due to the wide availability of mobile devices in the world market (smartphones, tablets, etc.). However unlike the cloud computing has proven a big

development and performance in communication technologies, the mobile devices are not able to a fully benefit from this development due to their resource's limitations especially their battery life.

The proposed work is in this paper will permit a best saving of consumption energy for the customer by a mart splitting of request by the best elected mobiles. This splitting permits the minimization of the processing time and using the minimum of the power usage.

This layer will provide a significant Green computing system capable of handling multiple tasks with minimal resources and deliver in a very time the desired services by the client.

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